Research Paper

Use of topical brimonidine to prevent intraocular pressure elevations following Nd: YAG-laser posterior capsulotomy

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ABSTRACT

Objective: To study the effect of brimonidine on intraocular pressure (IOP) following capsulotomy among Indian subjects. **Materials and Methods:** The study was a nonrandomized trial with open label. **Results:** 80% of the subjects showed a decrease in IOP after instilling 0.2% brimonidine (1 hour pre capsulotomy). No such decrease was observed in control. After 1 and 4 h post capsulotomy a statistically significant decrease in IOP ranging between 1–10 mmHg was found in 73.3% of the treatment group. **Conclusions:** In the present study 0.2% brimonidine has been proven effective to counteract the increase in IOP following Nd-YAG laser capsulotomy in Indian setting.

Key words: Brimonidine, intraocular pressure, Nd-YAG laser capsulotomy, posterior capsular opacification

INTRODUCTION

WHO defines blindness as visual acuity less than 3/60 (Snellen) or inability to count fingers in day light at a distance of 3 m.[1] Eighty percent of blindness is avoidable, i.e., readily treatable and/or preventable.[1]

Major cause of blindness currently in India is cataract (62.6%).[2] Majority of the cataract surgeries performed nowadays is by extra capsular cataract extraction (ECCE).[3] Chances of posterior capsular opacification (PCO) remain high with ECCE with or without intraocular lens (IOL) and hence it is one of the most important complication of ECCE. It leads to decrease in vision post-operatively to an extent that it diminishes more than pre-operative state.[4] Although, overall incidence of PCO is now rapidly decreasing – from 50% in the 1980s and early 1990s to less than 10% currently.[4] A noninvasive method of dealing with PCO is Nd-YAG laser capsulotomy. But Nd-YAG laser has its own problems like corneal haze, uveitis, hyphema, lens pits, and retinal detachment but the most consistent complication is the post-capsulotomy rise in intraocular pressure (IOP).[5] Rise in IOP is probably caused by clogging of the trabeculum with debris.[7] This is maximum after 2–4 hours of procedure.[6]

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Drug brimonidine is usually used in the treatment of glaucoma as it lowers the IOP and reduces risk of progression and loss of vision. Mode of action is by α2-adrenergic receptor agonist, thus resulting in lowering of IOP.[7-9] It has dual mechanism of action – firstly it decreases the aqueous humor formation and secondly it increases the uveoscleral outflow.[9] Brimonidine is proven safe and well-tolerated.[7,8,10] Ciprofloxacin is a synthetic chemotherapeutic and is a second-generation fluoroquinolone antibacterial. It kills bacteria by interfering with the enzymes that cause DNA to rewind after being copied, thereby stopping DNA and protein synthesis.[11] Ciprofloxacin

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does not have any documented effect on IOP. The present study documents the effect of brimonidine on the prevention of this post-procedural spike of IOP in the Indian subjects.

MATERIAL AND METHODS

Ethical clearance was obtained to carry out this open–label, nonrandomized trial. Study subjects who consented to be a part of the study were selected and matched in terms of age and sex. The inclusion criteria in the study was non-glaucomatous subjects who presented with dimness of vision following PCO after ECCE, advised for Nd-YAG laser posterior capsulotomy at Surat Municipal Institute of Medical Education and Research (SMIMER). Exclusion criteria included subjects who were glaucomatous, high myopic, having corneal opacities and uveitis. Those subjects who had not consented were also excluded from the present study.

A purposive sample of 60 subjects (60 eyes), as per the inclusion criteria, participated in the study. Purpose and procedures were explained and after obtaining written informed consent, they were allocated in two groups:
Group A: Subjects who were instilled with 0.2% brimonidine[7-9]
Group B: Treated with 0.3% ciprofloxacin

The pre-procedural assessment, sociodemographic profile, clinical history, and clinical ophthalmic examination of the subjects were recorded in a pretested and semi-open-ended performa. Ophthalmic examination included:
1. Torch light examination of eye
2. Visual acuity by Snellen's chart and vision with pin hole
3. Subjective refraction
4. Fundoscopy (direct and indirect)
5. IOP measurement

Base-line IOP was recorded by Goldmann Applanation tonometer. Before an hour of the capsulotomy, subjects from Group A were instilled with one drop of brimonidine 0.2% [pharmacological name: 5-bromo-6(2-imidazolidinylideneamino) quinoxaline-L-tartarate and trade name: Alphagan]. However in the subjects belonging to Group B, one drop of ciprofloxacin 0.3% was instilled. IOP was again recorded after 1 hour of instillation of drug (pre-laser post-drop IOP). YAG laser for PCO was done in both the groups under topical anesthesia. The power setting of the YAG machine for both the groups was between 2 to 3 mJ per pulse and the number of shots ranged from 2 to 4 per patient depending upon the thickness of PCO.

Immediately post-capsulotomy, 0.2% of brimonidine and 0.3% of ciprofloxacin were again instilled in subjects of Group A and Group B, respectively. IOP was recorded after 1 and 4 hours to document the effect of brimonidine in terms of change in IOP. Data were recorded and analyzed by the help of Epi 6.04.

RESULTS

Majority of the subjects in both groups belonged to the age group of 41-60 years; this can be attributed to the higher incidence of cataract in this age group.[2] Out of total 60 subjects, who participated in the study, 26 (43.3%) were males and 34 (56.7%) were females.

Pre treatment (baseline) IOP was recorded one hour before the YAG laser capsulotomy and majority of subjects in both the groups had IOP between 10–19 mmHg. None of them had an IOP above 20 mmHg hence adhering to the inclusion criteria of being non glaucomatous at the time of capsulotomy [Table 1].

Post Brimonidine Pre Laser IOP i.e. IOP after one hour of instillation of Brimonidine in Group A revealed a fall in IOP prior to YAG laser capsulotomy [Table 2]. A decrease in the IOP was noted in 24 subjects of Group A. However no such decrease in IOP was observed in Group-B.

Immediately post capsulotomy 0.2% of brimonidine and 0.3% of ciprofloxacin were again instilled in subjects of Group-A and Group-B respectively [Table 3].

Following observations were made:
Post capsulotomy after 1hour, out of 30 subjects in Group A, rise in IOP was seen in only 1(3.3%). However Group B 14(46.6%) subjects had raised IOP. This rise ranged from 0–10 mmHg. Amongst subjects of Group-A, 50% had a fall of 1-5mmHg in IOP whereas no such fall was seen in subjects of

Table 1: Pretreatment (baseline) intraocular pressure

IOP (mmHg)	No. of subjects		Total
	Group A	Group B	
<10	02 (6.66)	00	02 (3.33)
10–15	14 (46.67)	18 (60)	32 (53.33)
16–19	14(46.67)	12(40)	26 (43.34)
20–25	00	00	00
>25	00	00	00
Total	30	30	60

Figures in the parenthesis indicates percentage

Table 2: IOP 1 h post brimonidine (prelaser IOP)

Percentage fall in IOP	No. of subjects	
	Group A	Group B
0–10	0	00 (00)
11–20	10 (33.3)	00 (00)
21–30	10 (33.3)	00 (00)
31–40	1 (3.4)	00 (00)
>40	3 (10)	00 (00)
No change in IOP	6 (20)	30 (100)
Total	30 (100)	30 (100)

Figures in the parenthesis indicates percentage

Table 3: Intraocular pressure changes after laser treatment

Intraocular pressure in mmHg	No. of subjects in Group A		No. of subjects in Group B	
	After 1 hour	After 4 hour	After 1 hour	After 4 hour
Rise in pressure				
1–5	1	0	9	6
6–10	0	1	5	18
>10	0	0	0	0
Fall in pressure				
1–5	15	12	0	0
6–10	10	10	0	0
>10	0	5	0	0
No change in pressure	4	2	16	6
Total	30	30	30	30

For applying chi square (χ^2) test fall in pressure and no change in pressure has been clubbed together

Group-B. No change in IOP was seen in 13.3% of subjects from Group A and 16 (53.3%) subjects of Group B. Observations in change of IOP after 1 h of the intervention were found to be highly significant with a *P* value of 0.00002.

After 4 h of YAG Laser capsulotomy IOP was raised in only 1 (3.3%) out of 30 subjects in Group A. On the contrary in subjects of Group B, 24(80 %) subjects had raised IOP. This rise ranged from 1-5 mm in 6 subjects (20%) and 6–10 mmHg in 18 (60%) subjects. In Group A, the proportions of subject having a fall of IOP between 1-10 mm was 73.3 % and 16.6% of subjects had a fall of more than 10 mm. However no such fall in IOP was seen in subjects from Group B. The observations after 4 h of the intervention were found to be highly significant with a *P* value of 0.000023.

DISCUSSION

Brimonidine has been tried to decrease the rise in IOP after YAG laser capsulotomy by several researchers.[12,13] In a study by Gartaganis *et al.,* a significant mean percent reduction in IOP was found after 0.2% brimonidine instillation 1 h pre capsulotomy and immediately post capsulotomy. However in the present study, when one drop of 0.2% brimonidine was instilled 1 hour pre-capsulotomy and immediately after Nd-YAG laser capsulotomy, IOP elevations were prevented. Yeom *et al.* had also documented similar observations where IOP decreased from the baseline in the group who were instilled with brimonidine. But in his study, decrease in IOP was significant after third postoperative hour ($P<0.05$), while the control group exhibited an increase in IOP. Present study also documents a decrease in IOP after 1 and 4 hour in Group A who were instilled with brimonidine. Thus present study provide substantial evidence in favor of brimonidine for prevention of acute rise in IOP after Nd:YAG laser posterior capsulotomy among Indian patients.

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